



CASEIN



Introduction

Casein is a derivative of skimmed milk and is used as a raw material for thermoplastic materials formerly used for products such as insulators, handles, buttons, artificial fibres and bristles. It is also used in adhesives, glues and micro-biological media, nerve tonic, for priming artists' canvasses as well as being used to fortify flour, bread and cereals. Casein is a protein present in skimmed (non-fat) milk which can be obtained by precipitation.

The composition of milk (%):

	Cow	Mare	Goat
Water	88.0	89.0	88.0
Fat	3.8	1.6	4.1
Protein*	3.3	2.7	3.4
Lactose	4.8	6.1	4.7
Ash	0.7	0.5	0.8
Total solids	12.8	10.9	13.0

Casein can be obtained using by one of the following methods:

- By allowing the milk to sour. The lactic acid produced precipitates the casein – known as lactic casein.
- By the addition of either dilute sulphuric or hydrochloric acid - the precipitate is known as acid casein.
- By the addition of rennet which contains the enzyme rennin which results in the precipitation of rennet casein which is much less soluble than the other two types (and the solutions are less stable). Rennet casein is used in the plastics industry.

Casein is able to swell, although does not dissolve appreciably in water except when an alkali is also present. Casein will therefore dissolve in a suspension of calcium hydroxide. However, when a film of this solution is exposed to air, the casein gradually becomes insoluble owing to the conversion of the calcium to calcium carbonate. This reaction is useful in the coatings industry, and is the basis of oil-free distempers which contain casein, whiting and lime together with borax or trisodium phosphate. It is supplied in powder form, which is mixed with water for use. The casein is rendered soluble by the alkali, and then forms the binder. In the dry film the casein gradually becomes insoluble, producing a hard coating.

Plastic

Plastic can be produced from casein. The latter is precipitated from milk, after acidification with sulphuric or hydrochloric acid. The casein is subsequently dried, mixed into a dough, extruded, then treated with formaldehyde. After several weeks it polymerises into a hard solid. This material is then cut and polished into the products mentioned above.

Casein glue is made from the dried curds of milk, mixed with lime and other chemicals. They are mixed cold. It has been used for plywood and wood-assembly work, but is comparatively costly. Casein glue bonds are water-resistant but prone to deterioration from moulds and fungi.

Edible casein is produced by separating, pressing and drying the lactic-acid-precipitated coagulum of skimmed milk.

Caseinates

The most-commonly used being calcium caseinate (used for making emulsions) and sodium caseinate (used in making imitation cheese), caseinates are also used in non-dairy products such as coffee creamer, topping and icings, providing nutritional and textural benefits. They are considered to have a better flavour than products that are made with vegetable proteins. Edible caseinates are obtained by drying aqueous solutions, which themselves are prepared by combining dry edible casein with food-grade alkali.

Caseinates that are improperly manufactured or stored have a very strong, musty off-flavour. High fat, lactose and moisture contents contribute to the development of off-flavours, particularly if stored at too warm a temperature.

References, web-sites and further reading

- *Casein Products* (<http://www.nzic.org.nz/ChemProcesses/dairy/3E.pdf>)
- *Dairy Processing* Practical Action Technical Brief
- *Small-scale Preparation of Dairy Products Agrodok 36* Agromisa. (Free download available at: http://journeytoforever.org/farm_library/AD36.pdf)
- *La Preparation de Colle Animale* Hoekma S D, Ravenstyn J T J, de Coopibo P U, ATOL, 1981. This manual gives details on methods of making glue from animals. Technical processes describes include the preparation of glue from bone, skin, casein (milk derivative), and fish. (French)
- *Traditional Paint News Vol. 1 No 2 October 1996*, Baty P (ed), Traditional Paint Forum, 1996. Articles in this issue include: Trompe l'oeil architectural painting, some notes on distempers, calcimine and casein paints, linseed oil and other drying oils used in paint making.
- *Paints and their history* (<http://www.mikewye.co.uk/PaintsArticle.pdf>)

Practical Action
The Schumacher Centre for Technology and Development
Bourton-on-Dunsmore
Warwickshire, CV23 9QZ
United Kingdom

Tel: +44 (0)1926 634400
Fax: +44 (0)1926 634401

E-mail: inforsew@practicalaction.org.uk
Website: <http://www.practicalaction.org/>